

What is claimed is:

1. A process for preparing tetrahydrogeranylacetone, comprising
  - I. an aldol condensation of citral with acetone in the presence of aqueous alkali comprising at least one alkali metal hydroxide to form a condensate comprising pseudoionone and
  - II. a hydrogenation of the condensate.
2. The process according to claim 1, wherein steps I. and II. are carried out separately and successively.
3. The process according to claim 1 and 2, wherein, continuously,
  - a. citral, an excess of acetone and aqueous alkali are mixed at a temperature in the range from 10 to 120°C to give a homogeneous solution,
  - b. subsequently, the homogeneous reaction mixture is passed in liquid form, with prevention of backmixing, at a temperature which is from 10 to 120°C above the boiling point of acetone, under a pressure which is from  $10^6$  to  $10^7$  Pa above the corresponding vapor pressure, but at least corresponds to the autogenous pressure of the reaction mixture, through a reactor which enables a residence time of from 2 to 300 minutes,
  - c. the reaction mixture is cooled under decompression,
  - d. excess acetone is removed from the reaction mixture in countercurrent using steam,
  - e. the thus obtained crude product is purified using a rectification column and then
  - f. the thus obtained pseudoionone is hydrogenated to tetrahydrogeranylacetone.
4. The process according to claims 1 to 3, wherein the homogeneous solution of citral, acetone and aqueous alkali is prepared by removing the undissolved proportion of the aqueous alkali from the homogeneous mixture before the reaction.
5. The process according to claims 1 to 4, wherein acetone is added in a from 5- to 50-fold molar excess by removing the unconverted proportion downstream from the reaction zone at a pressure of from  $10^7$  to  $5 \cdot 10^8$  mPa<sub>abs.</sub> and feeding the fresh acetone back to the synthesis.
6. The process according to claims 1 to 5, wherein the reaction temperature at a given residence time is selected in such a way that the conversion of citral is from 60 to 98%, and the unconverted citral is removed and recycled into the reaction.

7. The process according to claims 1 to 6, wherein the water content of the acetone used for the reaction is between 1 and 15% by weight.
- 5 8. The process according to claims 1 to 7, wherein the concentration of the alkali metal hydroxide used for the reaction in the aqueous alkali is between 0.005 and 50% by weight.
- 10 9. The process according to claims 1 to 8, wherein the acetone used consists substantially of excess acetone, removed after the reaction, having a water content of from 1 to 15% by weight, to which either anhydrous or hydrous acetone having a water content of from 1 to 15% by weight may be added.
- 15 10. The process according to claims 1 to 9, wherein the water content of the acetone is adjusted by using a stripping column to remove the acetone from the reaction mixture, said stripping column being filled with commercial, structured packing elements, and irrigating it with an amount of from 10 to 90% of the acetone removed.
- 20 11. The process according to claims 1 to 10, wherein the by-products present in the crude product comprising pseudoionone are removed and converted to acetone by action of a base in the presence of water.
- 25 12. The process according to claims 1 to 11, wherein the hydrogenation is carried out in liquid phase over suspended particles of a catalyst which is capable of preferentially hydrogenating carbon-carbon double bonds over carbon-oxygen double bonds, in the presence of a hydrogenous gas.
- 30 13. The process according to claims 1 to 12, wherein hydrogenation is effected using a catalyst whose active component comprises palladium.
14. The process according to claims 1 to 13, wherein the hydrogenation is carried out in an apparatus which inhibits the transport of the catalyst particles.
- 35 15. The process according to claim 14, wherein the apparatus inhibiting catalyst transport which is used is a knit, a bed, an open-cell foam structure or a packing element.
- 40 16. The process according to claims 14 and 15, wherein an apparatus inhibiting the transport of the catalyst particles is used which has orifices or channels whose hydraulic diameter is from 2 to 2000 times the average diameter of the catalyst particles.

17. The process according to claims 1 to 16, wherein the product of the hydrogenation is continuously removed from the catalyst suspension using a crossflow filter.
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18. The process according to claims 1 to 17, wherein catalyst particles having a diameter of from 0.0001 to 2 mm are used in the hydrogenation.
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19. The process according to claims 10 to 18, wherein the liquid phase and the hydrogenous gas are conducted through the apparatus inhibiting the transport of the catalyst particles at a superficial velocity of more than 100 m<sup>3</sup>/m<sup>2</sup>h.
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20. The process according to claims 1 to 19, wherein the liquid phase in the hydrogenation comprises at least 80% by weight of hexahydropseudoionone.
21. The process according to claims 1 to 20, wherein the reaction pressure in the hydrogenation is selected in the range from 1 to 100 bar<sub>abs</sub>.
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22. The process according to claims 1 to 21, wherein the reaction temperature in the hydrogenation is selected in the range from 20 to 120°C.
23. The use of tetrahydrogeranylacetone obtained according to claims 1 to 22 for preparing phytol, isophytol, tocopherol and/or tocopherol derivatives.
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24. A process for preparing tocopherols and/or tocopherol derivatives, comprising
- a) the preparation of tetrahydrogeranylacetone according to any of claims 1 to 22,
- b) a reaction of the thus obtained tetrahydrogeranylacetone with a vinylmagnesium halide to give 3,7,11-trimethyl-1-dodecen-3-ol
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- c) a reaction of thus obtained 3,7,11-trimethyl-1-dodecen-3-ol with diketene or ethyl acetoacetate to give the corresponding ester
- d) a rearrangement of the thus obtained ester by Carroll reaction to give 6,10,14-trimethyl-5-pentadecen-2-one,
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- e) a reaction of thus obtained 6,10,14-trimethyl-5-pentadecen-2-one with hydrogen to give 6,10,14-trimethyl-pentadecan-2-one,
- f) a reaction of thus obtained 6,10,14-trimethyl-pentadecan-2-one with a vinylmagnesium halide to give 3,7,11,15-tetramethyl-1-hexadecen-3-ol and
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- g) a reaction of 3,7,11,15-tetramethyl-1-hexadecen-3-ol to give tocopherol and
- h) if appropriate, an acetylation of the thus obtained tocopherol.
25. A process for preparing tocopherols and/or tocopherol derivatives, comprising

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- a) an aldol condensation of citral with acetone in the presence of a basic substance to form a condensate comprising pseudoionone,
- b) a hydrogenation of the pseudoionone present in the condensate to give 6,10-dimethyl-2-undecanone,
- c) a reaction of thus obtained 6,10-dimethyl-2-undecanone with acetylene in the presence of a basic compound to give 3,7,11-trimethyl-1-dodecyn-3-ol,
- 10 d) a reaction of thus obtained 3,7,11-trimethyl-1-dodecyn-3-ol with hydrogen in the presence of a catalyst comprising palladium, silver and/or bismuth and carbon monoxide to give 3,7,11-trimethyl-1-dodecen-3-ol,
- e) a reaction of thus obtained 3,7,11-trimethyl-1-dodecen-3-ol with diketene or ethyl acetoacetate to give the corresponding ester,
- f) a rearrangement of the thus obtained ester to give 6,10,14-trimethyl-5-pentadecen-2-one by Carroll reaction,
- 15 g) a reaction of thus obtained 6,10,14-trimethyl-5-pentadecen-2-one with hydrogen to give 6,10,14-trimethylpentadecan-2-one,
- h) a reaction of thus obtained 6,10,14-trimethylpentadecan-2-one with acetylene in the presence of a base to give 3,7,11,15-tetramethyl-1-hexadecyn-3-ol,
- 20 i) a reaction of thus obtained 3,7,11,15-tetramethyl-1-hexadecyn-3-ol with hydrogen in the presence of a catalyst comprising palladium, silver and/or bismuth and carbon monoxide to give 3,7,11,15-tetramethyl-1-hexadecen-3-ol and
- j) a reaction of 3,7,11,15-tetramethyl-1-hexadecen-3-ol to give tocopherol and/or tocopherol derivatives and
- 25 k) if appropriate, an acetylation of the thus obtained tocopherol.